

Name Key
Review of limits and continuity

Calculus Q1 T1

1. Determine the value of c that makes the piecewise-defined function $g(x)$ everywhere

continuous. $g(x) = \begin{cases} \sqrt{x+4}, & x < 5 \\ x^2 + c, & x \geq 5 \end{cases}$ $\sqrt{5+4} = \sqrt{9} = 3$
 $5^2 + c = 3 \rightarrow 25 + c = 3 \rightarrow c = -22$



2. Is $h(x)$ continuous for all real numbers? If so show why.

$h(x) = \begin{cases} x+3, & x \leq -1 \\ -x^2, & x > -1 \end{cases}$ $-1+3=2$ $-(-1)^2 = -1$ No, not continuous when $x = -1$



3. Evaluate $\lim_{h \rightarrow 0} \frac{(2+h)^2 - 4}{h}$. $\frac{4 + 4h + h^2 - 4}{h} \rightarrow \frac{4h + h^2}{h} \rightarrow \frac{h(4+h)}{h} \rightarrow 4 + 4 = 8$

4. Evaluate $\lim_{x \rightarrow 4} \frac{x-4}{\sqrt{x^2-16}}$. $\frac{x-4}{\sqrt{x^2-16}} = \frac{(x-4)(\sqrt{x^2-16})}{x^2-16} = \frac{(x-4)(\sqrt{x^2-16})}{(x-4)(x+4)} = \frac{\sqrt{x^2-16}}{x+4} = \frac{0}{8} = 0$

5. Evaluate $\lim_{x \rightarrow 0} \frac{2^x - 1}{2^x}$. $\frac{2^0 - 1}{2^0} = \frac{1 - 1}{1} = \frac{0}{1} = 0$

6. Evaluate $\lim_{x \rightarrow 2} \frac{x^2 + 3x - 10}{x - 2}$. $\frac{(x+5)(x-2)}{(x-2)} = x+5$

$$2+5 = \boxed{7}$$

7. Evaluate $\lim_{x \rightarrow \infty} \frac{2x^3 - 3}{3x^3 + 25}$. $= \boxed{\frac{2}{3}}$

8. Evaluate $\lim_{x \rightarrow \infty} \frac{2x^2 + 3x}{3x^2 + 2x}$. $\frac{+}{+} = \boxed{\infty}$

*** Check coefficients
(+) or (-)**

9. Evaluate $\lim_{x \rightarrow 1} \frac{x-1}{\sqrt{x^2+3} - 2}$. $\frac{\sqrt{x^2+3} + 2}{\sqrt{x^2+3} + 2} = \frac{(x-1)(\sqrt{x^2+3} + 2)}{x^2+3 - 4} = \frac{(x-1)(\sqrt{x^2+3} + 2)}{x^2 - 1}$

$$\frac{(x-1)(\sqrt{x^2+3} + 2)}{(x-1)(x+1)} = \frac{\sqrt{x^2+3} + 2}{x+1} = \frac{\sqrt{1^2+3} + 2}{1+1} = \frac{4}{2} = \boxed{2}$$

10. Evaluate $\lim_{x \rightarrow 4} \frac{x+14}{\sqrt{x^2-7}}$.

$$\frac{4+14}{\sqrt{4^2-7}} = \frac{18}{\sqrt{9}} = \frac{18}{3} = \boxed{6}$$

In # 11 – 20, which of the statements are true about the function $y = f(x)$ graphed and which are false?

11. Find $\lim_{x \rightarrow -1^-} f(x) = 1$. True

12. Find $\lim_{x \rightarrow 2} f(x) = DNE$. False

13. Find $\lim_{x \rightarrow 2} f(x) = 2$. False

14. $f(2) = 2$ True

15. Find $\lim_{x \rightarrow 1^-} f(x) = 2$. True

16. Find $\lim_{x \rightarrow 1^+} f(x) = 1$. True

17. Find $\lim_{x \rightarrow 1} f(x) = DNE$. True

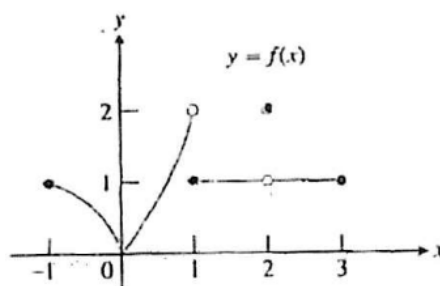
18. Find $\lim_{x \rightarrow 0} f(x) = \lim_{x \rightarrow 0^+} f(x)$. True

19. $\lim_{x \rightarrow c} f(x)$ exists at every c in $(-1, 1)$ True

[note: $()$ means that the endpoints are not included].

20. $\lim_{x \rightarrow c} f(x)$ exists at every c in $(1, 3)$. True

[note: $()$ means that the endpoints are not included].



$$21) \lim_{x \rightarrow 0} \frac{1}{x^2}$$

$$x \rightarrow 0^- \quad \frac{1}{(-.01)^2} = \frac{+}{+} = \infty$$

$$x \rightarrow 0^+ \quad \frac{1}{(.01)^2} = \frac{+}{+} = \infty$$

match
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	0	30	45	60	90
sin	$\frac{\sqrt{0}}{2} = 0$	$\frac{\sqrt{1}}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{3}}{2}$	$\frac{\sqrt{4}}{2}$
cos	$\frac{\sqrt{4}}{2} = 1$	$\frac{\sqrt{3}}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{1}}{2}$	$\frac{\sqrt{0}}{2}$
tan	0	$\frac{1}{\sqrt{3}}$	1	$\sqrt{3}$	Und